REMARKS

The Office examined claims 1-4, rejected claims 1 and 3, and objected to claims 2 and 4. With this paper, co claims are canceled, and no new claims are added, so that claims 1-4 remain in the application.

Rejections under 35 USC §112, first paragraph

At section 1 of the Office action, claims 1 and 3 are rejected under 35 USC §112, first paragraph as allegedly failing not enabled because of the use of the term "integral multiple" occurring in the claims and in the specification but not defined. The claims recite a "dimensionality that is at least four and is an integral multiple of two."

Applicant respectfully submits that the term "integral multiple" is commonly used in science, engineering, and mathematics to indicate a value obtained by multiplying another value (in claims 1 and 3, the other value is the value two) by an integer (as opposed to some other kind of number, such as a fraction). See e.g. the definition of harmonic on the Web at http://www.atis.org/tg2k/_harmonic.html, repeated here:

> harmonic: 1. Of a sinusoidal wave, an *integral multiple* of the frequency of the wave. Note: The frequency of the sine wave is called the fundamental frequency or the first harmonic, the second harmonic is twice the fundamental frequency, the third harmonic is thrice the fundamental frequency, etc. 2. Of a periodic signal or other periodic phenomenon, such as an electromagnetic wave or a sound wave, a component frequency of the signal that is an integral multiple of the fundamental frequency. Note: The fundamental frequency is the reciprocal of the period of the periodic phenomenon.

Thus, the claims recite a dimensionality of 4, 6, 8, 10, …, and so on.

Nevertheless, as requested by the Examiner for purposes of compact prosecution, applicant has here amended claims 1 and 3 to avoid the question of a definition of "integral multiple." Since

the claims as filed recite "dimensionality that is at least four and is an integral multiple of two," and since any multiple of two by an integer still results in a value that is a multiple of two, the claims now recite simply "dimensionality that is at least four and is a multiple of two."

Accordingly applicant respectfully requests that the rejections under 35 USC §112, first paragraph, be withdrawn.

Rejections under 35 USC §102

At section 3 of the Office action, claims 1 and 3 are rejected under 35 USC §102 as being anticipated by Kim ("4-Dimensional Modulation for a bandlimited channel using Q^2PSK").

Claims 1 and 3 both recite telecommunication using a signal constellation of symbols having a dimensionality that is at least four and is a multiple of two, where each symbol corresponds to an ordered set of at least two sets of two or more numbers, and further characterized in that for each of the at least four-dimensional symbols, *a modulator modulates the carrier signal using in turn each of the at least two sets of two or more numbers.* Thus, in the case of a dimensionality of four, with each symbol corresponding to two sets of two numbers, a transmitted/ output signal according to the invention would be represented by:

$$A_i(t)=\sum_{j=1}^{2} a_{ij}e_j(t)+\sum_{j=1}^{2} a'_{ij}e_j(t+\delta), \text{ for } i=1 \text{ and } 2,$$

where the a_{ij} and a'_{ij} are the two sets of two numbers, and the e_j are two orthogonal waveforms (e.g. a sine and a cosine), and, most importantly, are the same two orthogonal waveforms in each of the indicated summations.

By contrast, from eq. (1) of Kim (in col. 2), it is seen that for the corresponding case (a dimensionality of four) Kim teaches a transmitted/ output signal represented by:

$$A_i(t) = \sum_{j=1}^{4} a_{ij} e_j(t), \text{ for } i=1, \ldots, 4,$$

where the a_{ij} are (for each i) a four-dimensional vector, i.e. a set of four numbers, and the e_j are four orthogonal waveforms. The difference in the above two representations is because Kim does not anywhere teach or suggest modulating the carrier signal using in turn each of the at least two sets of two or more numbers, as in claims 1 and 3. Indeed the Office asserts only the Kim "inherently comprises modulating the carrier signal with the symbols or constellation from the symbol generator and the symbols or constellations have at least 2 ordered sets of at least 2 sets of 2 or more numbers." The Office does however appear to rely on col. 2, ll. 1-15, and Fig. 1 in asserting the inherent teaching in this respect, but it is that portion of Kim that applicant is pointing to as teaching rather the opposite, i.e. using in effect a single four-dimensional modulator instead of twice using a two-dimensional modulator.

Accordingly, applicant respectfully requests that the rejections under 35 USC §102 be reconsidered and withdrawn.

Conclusion

For all the foregoing reasons it is believed that all of the claims of the application are in condition for allowance and their passage to issue is earnestly solicited.

Respectfully submitted,

Nov. 3, 2005
Date

James A. Retter
Registration No. 41,266

WARE, FRESSOLA, VAN DER SLUYS
& ADOLPHSON LLP
755 Main Street, P.O. Box 224
Monroe, CT 06468-0224

tel: (203) 261-1234
Cust. No.: 004955